

## English Translation of IDS art

## PATENT ABSTRACTS OF JAPAN

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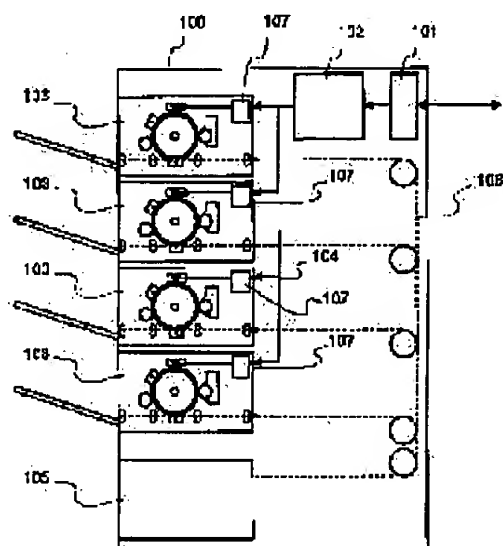
(21)Application number : 10-172087 (71)Applicant : RICOH CO LTD  
 (22)Date of filing : 05.06.1998 (72)Inventor : KANEYA MITSUHISA

## (54) ARRAY TYPE PRINTER

## (57)Abstract:

PROBLEM TO BE SOLVED: To obtain an array type printer comprising a plurality of juxtaposed imaging sections being operated in parallel in which high speed printing can be performed while suppressing cost increase incident to parallel operation.

SOLUTION: The array type printer for receiving print data externally and printing the received data in parallel comprises a plurality of imaging sections 103 arranged in array each forming an image corresponding to the received image data onto a recording sheet, an image writing section 102 for processing the print data into an image data to be written, and a bus mechanism 104 for connecting the image writing section 102 with the plurality of imaging sections 103 and having a guaranteed band width and broadcast function wherein print operation is performed in parallel by delivering an image data from the image writing section 102 to the plurality of imaging sections 103 through the bus mechanism 104.



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CLAIMS

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[Claim]

[Claim 1] In the array type printer which accepts the print data supplied and performs printing processing in parallel from the exterior Two or more image formation meanses to form a picture image in the recording paper according to the image data which has been arranged in the shape of an array and supplied, respectively, A picture image drawing means to process it into the image data which should draw the aforementioned print data, and to output this image data, The bus device which bandwidth is guaranteed, and has a multiple address function, and connects the aforementioned picture image drawing means and two or more aforementioned image formation meanses, The array type printer characterized by supplying the image data from \*\*\*\*\* and the aforementioned picture image drawing means to two or more aforementioned image formation meanses in multiple address via the aforementioned bus device, and performing an parallel printing operation.

[Claim 2] The aforementioned bus device is IEEE. Standard for aHigh Performance Serial Array type printer given in the claim 1 characterized by using the bus device specified by Bus (IEEE Std 1394-1995).

[Claim 3] The aforementioned image formation means is an array type printer given in the claim 2 characterized by having a power control means to input the power supplied from mainframe power through a power connector as IEEE1394 interface specified in IEEE1394, and to control start/halt of the electric power supply at the time of \*\*\*\*\* for the aforementioned power connector area.

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DETAILED DESCRIPTION

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[Detailed description]

[0001]

[The technical field to which invention belongs] this invention relates to the array type printer which realizes cost performance by adopting the bus device in which the bus which arranges two or more image formation sections which used electrophotography process devices, such as a LASER beam printer, in the shape of an array, and carries out data transfer to two or more image formation sections of each was guaranteed to bandwidth.

[0002]

[Prior art] In an office environment, a copy pin center, large, etc. which create a lot of printing documents, the capacity which a printer processes, i.e., the printing processing number of sheets per time, affects [ big ] working efficiency. For this reason, according to the amount of document processing systems, the LASER beam printer etc. is installing the printer with the image formation section using the electrophotography process etc.

[0003] However, since such a printer of a kind needed to be equipped with the bus device only for the data transfer in which a lot of memory for frame buffers and high-speed processings are possible as it becomes high-speed, it made cost elevation invite in connection with memory or bus loading, and had the fault of spoiling economical efficiency. In an electrophotography process, if it puts in another way, in order to have to send in image data in synchronization to a process, there is no way piece \*\*\*\*\* at a very short time interval about the data of a constant rate (it increases so that a process speed is quick), and it is necessary to supply a process.

[0004] Then, although the method of making quick process speeds, such as \*\*\*\* in the image formation section and feeding, as an approach which realizes improvement in the speed of a printer is common, two or more image formation sections are arranged in equipment, and the so-called multi-type of printer of operating them in parallel is known. Especially this is effective in within a time [ which was able to define the printed matter of the same content ] as a means for obtaining more mostly.

[0005] As reference technical reference relevant to such a printer, the "distribution technique of a multi-printer system and a printing job" of the publication number 324227 [ five to ] is indicated. Through the network distributed bidirectional data bus which consists of for example, a SCSI bus, two or more image formation sections are connected, a printing job is distributed to the image formation section which is not working now, and printing processing is performed especially here. In addition, generally the data transfer rate of SCSI remains in a maximum of 5 Mbpses.

[0006]

[Object of the Invention] However, if it was in a Prior art which is shown above, there were a bus which connects two or more image formation sections, and a trouble which is described below in the field of the memory for frame buffers.

[0007] (1) In order to transmit image data as a bus print speed becomes quick, a high-speed bus is needed. especially the amount of data in a full color printer -- for example, resolution -- the size of 400dpi and the recording paper -- A4 it is -- a case -- about 64 M bytes -- reaching . Although the bus where the bit width of face of a bus is wide is generally used in order to deal with such a lot of data, it is so difficult that the width of face of a bus becomes large to secure bus length, and since it is sensitive, a design is not easy to the load connected. Moreover, such a bus makes cost elevation generally invited.

[0008] Furthermore, the bandwidth of the bus for data transfer is proportionally demanded-like as the number of the image formation sections increases, in order to have to perform data transfer separately by time sharing to each node on a bus. If the number of the image formation sections is two and it is about 128 M bytes and four in case the picture image in the case of such a bus, for example, the above-mentioned full color printer, is sent to each image formation section, about 256 M bytes of data transfer will occur. The bus with the possible bandwidth of sending such a lot of data in practical time is very expensive, and had a problem in respect of economical efficiency.

[0009] (2) In order to compensate the real-time nature of the memory bus for frame buffers, the memory for frame buffers is required for each image formation section. However, much buffer memory is demanded as a print speed becomes quick. Moreover, you have to equip buffer memory in this case supposing the worst value of retardation of data transfer.

[0010] For this reason, in a high-speed electrophotography process, the bus for data transfer is real-time nature (the bandwidth (it is also called the difference of the highest frequency and lowest frequency which can use bandwidth: signal, and Quality of Service) for every time interval short enough). When it does not have, the method of carrying out the parallel operation of two or more image formation sections for the buffer memory of the amount near one frame or it is not practically equal mainly produced commercially for the public from the ground of economical efficiency in essence with carrying out parallel operation of two or more sets of the printers.

[0011] this invention aims at being made in view of the above, and suppressing the cost elevation accompanied by a parallel operation in the equipment which the parallel arrangement of two or more image formation sections is carried out equipment ], and carries out a parallel operation, and enabling high-speed printing processing.

[0012]

[The means for solving a technical problem] If it is in the array type printer concerning a claim 1 in order to attain the above-mentioned purpose In the array type printer which accepts the print data supplied and performs printing processing in parallel from the exterior Two or more image formation meanses to form a picture image in the recording paper according to

the image data which has been arranged in the shape of an array and supplied, respectively, A picture image drawing means to process it into the image data which should draw the aforementioned print data, and to output this image data, Bandwidth is guaranteed, and it has a multiple address function, and has the bus device which connects the aforementioned picture image drawing means and two or more aforementioned image formation meanses, the image data from the aforementioned picture image drawing means is supplied to two or more aforementioned image formation meanses in multiple address via the aforementioned bus device, and an parallel printing operation is performed.

[0013] Moreover, if it is in the array type printer concerning a claim 2, the aforementioned bus device is IEEE. Standard for a High Performance Serial The bus device specified by Bus (IEEE Std 1394-1995) is used.

[0014] Moreover, if it is in the array type printer concerning a claim 3, the aforementioned image formation means is equipped with a power control means to input the power supplied from mainframe power through a power connector as IEEE1394 interface specified in IEEE1394, and to control start/halt of the electric power supply at the time of \*\*\*\*\* for the aforementioned power connector area.

[0015]

[Gestalt of implementation of invention] Hereafter, the array type printer of this invention is explained with reference to an accompanying drawing. In addition, in each drawing shown below, in order to simplify an explanation, this invention and directly, the sites (for example, an electrical power system, a control system, a user interface, etc.) which are not related are omitted. Moreover, especially, although it is description which mainly directed its attention to the data flow between each part, as long as there is no notice, an ellipsis fraction is based on the function of a usual printer etc.

[0016] [Gestalt 1 of enforcement] drawing 1 is explanatory drawing showing the outline configuration of the array type printer concerning the gestalt 1 of enforcement. In drawing, 100 is the mainframe of an array type printer. The external-interface section 101, The picture image drawing section 102 as a picture image drawing means which generates the image data for drawing and sends the image data which drew through the bus device among the image formation section 103 mentioned later, In order to connect the image formation section 103 as two or more image formation meanses arranged in the shape of an array, and the picture image drawing section 102 and the interface-control section 107 of each image formation section 103 and to transmit image data The bus device 104 in which bandwidth is guaranteed and it has a multiple address (multicasting) function to two or more nodes, The recording paper is held and it has the feed section 105 which delivers the recording paper one by one according to a feed signal, and feeding / conveyance section 106 which conveys the recording paper delivered from the feed section 105 among each image formation section 103.

[0017] Moreover, although the four image formation sections 103 should be carried in this example, the size of the number of the image formation sections 103 is good related still mostly or at least to the essence of this invention. Moreover, although the write-in formula and \*\*\*\* process of the image formation section 103 recognize various presence of laser writing and an electrophotography formula, an ink-jet formula, etc. which are represented by the laser printer, with the gestalt of this enforcement, the image formation section which adopted laser writing and the electrophotography formula is used for it. That is, it has each units (the exposure and electrification - the development, imprint, etc.), fixing / delivery unit, etc. based on the laser-beam study system and the electrophotography process of performing optical writing on a photo conductor drum front face based on image data.

[0018] Next, it explains, supplementing with the function about an operation of the array type printer constituted as mentioned above. The external-interface section 101 has the communication facility with printing demand origin (for example, host computer), and receives the printing demand and print data from printing demand origin. Subsequently, the printing demand and print data which were received are suitably passed the picture image drawing section 102.

[0019] The picture image drawing section 102 draws and creates the image data according to the optical resolution of the image formation section 103 based on print data, and accumulates it in memory etc. if needed. This processing is processing which is generally called a rendering and rasterizing, for example, creates the bit map data of the pixel base from a Page Description Language (PDL).

[0020] The image data created in the picture image drawing section 102 synchronizes with the speed of the electrophotography process of the image formation section 103, and is sent in multiple address (the same image data simultaneous) to each image formation section 103 via the bus device 104 in which the bandwidth in a time interval short enough is guaranteed.

[0021] In each image formation section 103, if required [ without buffering the image data sent synchronizing with an electrophotography process ], via FIFO of small capacity, it is sent to a laser-beam study system, and \*\*\*\*s based on an electrophotography process. In addition, about the detail of this laser-beam study system and an electrophotography process, since it is the technique generally known, an explanation here is omitted.

[0022] feeding / conveyance section 106 which paper is fed to the recording paper from the feed section 105, and this recording paper shows with a dashed line in parallel to execution of a \*\*\*\* process as mentioned above -- going -- this side of each image formation section 103 -- stopping -- registration -- and a skew correction is carried out Then, by the imprint charger, the above-mentioned recording paper is conveyed by the imprint section of a \*\*\*\* fraction by predetermined tie \*\*\*\*\* by rebooting of a resist roller, and the toner image formed in the photo conductor drum front face is imprinted, and fixing processing is performed further and paper is delivered.

[0023] now -- the gestalt of enforcement mentioned above -- the four image formation sections 103 -- although it is related when obtaining the printed matter of four sheets simultaneously using all, when dual-output number of sheets is three or less sheets, it controls so that the unnecessary image formation section 103 is beforehand made into a dormant state and feeding to the corresponding image formation section 103 is not performed

[0024] Moreover, they are able for the throughput of the picture image drawing section 102 and the bandwidth of the bus device 104 to come out enough, and to obtain temporarily, a certain printed matter of the content which is simultaneously different when becoming. However, since this operation is not the main point of this invention, a detailed explanation here is omitted.

[0025] In the array type printer of the gestalt 1 of enforcement mentioned above with the gestalt 2 of this enforcement [the gestalt 2 of enforcement] -- As a bus device in which the bandwidth which connects between the picture image drawing section 102 and each image formation section 103 was guaranteed IEEE Standard for a High Performance Serial The

example using the bus device specified by Bus (it is called "IEEE1394" and "IEEE1394 bus" IEEE Std 1394-1995 and the following) is described.

[0026] That is, the fundamental operation is the same as that of the gestalt 1 of enforcement mentioned above, and the synchronous transmission (Isochronous transfer) specified in IEEE1394 is used as a transfer means of the image data which is synchronized with the electrophotography process of the image formation section 103. Moreover, a transfer of transmission and reception of control signals (synchronizing signal between each part etc.), a command, and status information etc. performs altogether the I/O which is needed between the image formation sections 103 via IEEE1394 bus. The formula of using synchronous transmission (Isochronous transfer) in this case, for example, the I/O as which a time precision is required, and using asynchronous transmission (Asynchronous transfer) in being other is effective.

[0027] It adds about synchronous transmission (Isochronous transfer). If IEEE1394 is employed as a printer and Isochronous transfer is used, the merit which can lessen buffer memory carried in a printer will appear effectively in a page printer like a LASER beam printer especially. For example, in the case of a page printer, printing is started after storing the data for 1 page used as a printing object in buffer memory. For this reason, the printer carries several megabytes - some dozens of M bytes of buffer memory. In the case of the page printer of IEEE1394 correspondence, a reduction of a buffer and memory is realized by synchronizing image data with a motion of the laser beam which irradiates a photo conductor drum, and performing Isochronous transfer.

[0028] Drawing 2 is explanatory drawing showing the outline configuration of the array type printer concerning the gestalt 2 of enforcement. The device in which the image formation section 210 mentions this array type printer later so that it may become removable from the mainframe 200 of an array type printer is established to the configuration of drawing 1 mentioned above. Furthermore, while IEEE1394 bus 201 is adopted as a bus device, IEEE1394 interface-control section 202 is formed.

[0029] Using the interface (henceforth "IEEE1394 interface") specified in IEEE1394, IEEE1394 interface-control section 202 has a physical layer, a link layer, a transaction layer, and a bus FM (bus manager ability or Isochronous resource manager ability is included), and controls a transfer of the image data and control signal which passed IEEE1394 bus 201, a command, status information, etc.

[0030] Drawing 3 is explanatory drawing showing the configuration of the image formation section 210 of the array type printer shown in drawing 2. At the time of insertion, in the mainframe 200, this image formation section 210 is constituted so that it may be combined by the power connector 302 connected with the power control section 306 as a power control means which has IEEE1394 interface 301 connected with IEEE1394 interface-control section 304 mentioned later, and the power control function mentioned later, and the connector for feeding 303 which has the function of position doubling with the feed opening.

[0031] Moreover, IEEE1394 interface-control section 304 It has the physical layer specified in IEEE1394, a link layer, a transaction layer, and a bus FM (however, bus manager ability or Isochronous transfer resource manager ability does not need to contain). IEEE1394 bus 201 Pass and the received image data is immediately sent to the write-in control section 305 of a laser-beam study system, and also a control signal, a command, etc. are transmitted to the fraction (not shown) which takes charge of each processing.

[0032] In addition, the photo conductor drum 310 on which the laser-beam study system is used for the image formation section 210 shown in drawing 3 as a formula write-in [ optical ], the electrophotography process is used for it as a \*\*\*\* formula, and a \*\*\*\* latent image is formed based on this process. The electrification charger 311 which carries out uniform electrification of the photo conductor drum 310 at predetermined level. The developer 312 which a toner is made to adhere to the \*\*\*\* latent image formed in the photo conductor drum 310, and is made into the \*\*\*\* picture image of a toner image. It has the cleaning equipment 314 from which the imprint charger 313 which imprints the toner image formed of the developer 312 on the recording paper, the remains toner with which photo conductor drum 310 front face after an imprint remained are removed. Moreover, 315 is a resist roller for performing position doubling of the toner image and the recording paper which were formed in the photo conductor drum 310.

[0033] Moreover, in case the image formation section 210 is \*\*\*\*\*ed from a mainframe 200, even if an operator does not perform a special setup by using the automatic-setting function of the dynamic bus which is the feature of IEEE1394 bus 201, equipment performs the reconstitution of a setup autonomously. Moreover, the power control section 306 bears the electric power supply into the image formation section 210 on the basis of the power supplied from the mainframe 200, and also it takes charge of the control for performing safely the start and a halt of an electric power supply at the time of \*\*\*\*\*.

[0034] In addition, about an operation of the array type printer constituted as mentioned above, since it is fundamentally the same, an explanation here is abbreviated to the gestalt 1 of enforcement.

[0035] It collects by each item of a performance, a cost, maintainability, and flexibility and expandability, and [the effect of the gestalt of enforcement], next the effect that the array type printer of the gestalt 1 and 2 of the enforcement described above does so are described.

[0036] (1) Compared with the printer which accepted the one image formation section of the same performance, and used it, a performance equivalent to a n times as many print speed as this can be obtained by carrying out the parallel arrangement of the image formation section 103 of n performances (four sets in this case), or the image formation section 210, and carrying out a parallel operation. This demonstrates a big effect in the usage which obtains two or more printed matter from the single source especially.

[0037] Moreover, when making the printed matter of the same content from n sets of printers connected by the network etc. output each printer from printing demand origin -- receiving -- separate -- print data -- it is necessary to send (data transfer of two or more (n) times is performed) -- The array type printer of the gestalt of this enforcement becomes remarkable efficient dominance ] to such a conventional printer in a comparatively low speed network environment from which especially data transfer serves as a bottleneck just from what is necessary being to perform 1 time of data transfer.

[0038] (2) Since image data is supplied from the thing for which it is not necessary to have the memory for frame buffers every cost image formation section 103 and image formation section 210, and the picture image drawing section 102 with all the same image formation sections 103, it comes out enough only by having the one picture image drawing section per

printer 102, and, for a certain reason, economical equipment is realized by reduction of the number of memory etc.

[0039] Moreover, by the array type printer of the gestalt 2 of enforcement, since IEEE1394 cheap bus 201 is used highly efficiently for all I/O over the image formation sections 210, such as not only image data but a control signal, a command, status information, etc., and the expensive bus device only for data transfer etc. is unnecessary, it is enabled to offer the equipment with still high cost performance.

[0040] (3) As the gestalt 2 of maintainability enforcement explained, it is enabled to perform easily supply supply work called a supplement of the toner for development, the conveyance jam (paper jam) of the recording paper, depuration inside the plane, etc., and maintenance work by having considered as the configuration which can detach [ section / image formation / 210 ] freely from the mainframe 200 of an array type printer. Moreover, when a certain image formation section 210 breaks down, it is also possible to replace the corresponding image formation section 210 with another image formation section.

[0041] Furthermore, even if it can perform a maintenance service etc. by the operating condition and an operator does not perform a special setup, without intercepting the power of the whole printer by using the automatic-setting function of \*\*\*\*\* which is the feature of IEEE1394 bus 201, and a dynamic bus, implementation of the equipment which can perform the reconstitution of a setup autonomously is attained.

[0042] (4) By fluctuating the number of image formation section 103 and the image formation sections 210 which carry out flexibility and expandability loading, it is possible to realize the printer of various capacity by the same basic design. Moreover, by the array type printer of the gestalt 2 of enforcement, when the equipment manufacturer prepares the image formation section 210 for an addition as an option unit, an user can extend equipment if needed and it is enabled to build a system flexibly.

[0043] For example, the initial stage of an equipment introduction carries only a small number of (one or two) image formation section 210, and it becomes possible of it to add the image formation section 210 afterwards according to efficient needs, such as a print speed.

[0044] Moreover, an end user can perform additional work of the image formation section 210 easily, without requesting work from experts, such as a serviceman, by using the setting up function of the dynamic bus which IEEE1394 bus has, or performing change work of a monitor configuration.

[0045]

[Effect of the invention] As explained above, in order according to the array type printer (claim 1) concerning this invention to carry out the parallel arrangement of two or more image formation meanses and to carry out a parallel operation, The image formation meanses of the same performance Since printing processing proportional to the number of image formation meanses to use it can be performed compared with the printer which accepted one set and was used, and it is not necessary to have the memory for frame buffers for every image formation section meanses and the image data from the picture image drawing meanses by which all image formation meanses are still the same is supplied, It comes out enough only by having one picture image drawing meanses per printer, and, for a certain reason, economical equipment is realized by reduction of the number of memory etc.

[0046] Moreover, according to the array type printer (claim 2) concerning this invention, since IEEE1394 cheap bus is further used highly efficiently for all I/O over image formation meanses, such as not only image data but a control signal, a command, status information, etc., in addition to the effect of a claim 1 and the expensive bus device only for data transfer etc. is unnecessary, it is enabled to offer the equipment with still high cost performance.

[0047] Moreover, even if it can perform a maintenance service etc. by the operating condition and an operator does not perform a special setup, while implementation of the equipment which can perform the reconstitution of a setup autonomously is attained, without intercepting the power of the whole printer by using the automatic-setting function of \*\*\*\*\* which is the feature of IEEE1394 bus, and a dynamic bus according to the array type printer (claim 3) concerning this invention, maintainability, expandability, etc. of an image formation means improve.

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TECHNICAL FIELD

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[The technical field to which invention belongs] this invention relates to the array type printer which realizes cost performance by adopting the bus device in which the bus which arranges two or more image formation sections which used electrophotography process devices, such as a LASER beam printer, in the shape of an array, and carries out data transfer to two or more image formation sections of each was guaranteed to bandwidth.

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[0003] However, since such a printer of a kind needed to be equipped with the bus device only for the data transfer in which a lot of memory for frame buffers and high-speed processings are possible as it becomes high-speed, it made cost elevation invite in connection with memory or bus loading, and had the fault of spoiling economical efficiency. In an electrophotography process, if it puts in another way, in order to have to send in image data in synchronization to a process, there is no way piece \*\*\*\*\* at a very short time interval about the data of a constant rate (it increases so that a process speed is quick), and it is necessary to supply a process.

[0004] Then, although the method of making quick process speeds, such as \*\*\*\* in the image formation section and feeding, as an approach which realizes improvement in the speed of a printer is common, two or more image formation sections are arranged in equipment, and the so-called multi-type of printer of operating them in parallel is known. Especially this is effective in within a time [ which was able to define the printed matter of the same content ] as a means for obtaining more mostly.

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EFFECT OF THE INVENTION

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[0041] Furthermore, even if it can perform a maintenance service etc. by the operating condition and an operator does not perform a special setup, without intercepting the power of the whole printer by using the automatic-setting function of \*\*\*\*\* which is the feature of IEEE1394 bus 201, and a dynamic bus, implementation of the equipment which can perform the reconstitution of a setup autonomously is attained.

[0042] (4) By fluctuating the number of image formation section 103 and the image formation sections 210 which carry out flexibility and expandability loading, it is possible to realize the printer of various capacity by the same basic design. Moreover, by the array type printer of the gestalt 2 of enforcement, when the equipment manufacturer prepares the image formation section 210 for an addition as an option unit, an user can extend equipment if needed and it is enabled to build a system flexibly.

[0043] For example, the initial stage of an equipment introduction carries only a small number of (one or two) image formation section 210, and it becomes possible of it to add the image formation section 210 afterwards according to efficient needs, such as a print speed.

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TECHNICAL PROBLEM

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[Object of the Invention] However, if it was in a Prior art which is shown above, there were a bus which connects two or more image formation sections, and a trouble which is described below in the field of the memory for frame buffers.

[0007] (1) In order to transmit image data as a bus print speed becomes quick, a high-speed bus is needed. especially the amount of data in a full color printer -- for example, resolution -- the size of 400dpi and the recording paper -- A4 it is -- a case -- about 64 M bytes -- reaching . Although the bus where the bit width of face of a bus is wide is generally used in order to deal with such a lot of data, it is so difficult that the width of face of a bus becomes large to secure bus length, and since it is sensitive, a design is not easy to the load connected. Moreover, such a bus makes cost elevation generally invited.

[0008] Furthermore, the bandwidth of the bus for data transfer is proportionally demanded-like as the number of the image formation sections increases, in order to have to perform data transfer separately by time sharing to each node on a bus. If the number of the image formation sections is two and it is about 128 M bytes and four in case the picture image in the case of such a bus, for example, the above-mentioned full color printer, is sent to each image formation section, about 256 M bytes of data transfer will occur. The bus with the possible bandwidth of sending such a lot of data in practical time is very expensive, and had a problem in respect of economical efficiency.

[0009] (2) In order to compensate the real-time nature of the memory bus for frame buffers, the memory for frame buffers is required for each image formation section. However, much buffer memory is demanded as a print speed becomes quick. Moreover, you have to equip buffer memory in this case supposing the worst value of retardation of data transfer.

[0010] For this reason, in a high-speed electrophotography process, the bus for data transfer is real-time nature (the bandwidth (it is also called the difference of the highest frequency and lowest frequency which can use bandwidth: signal, and Quality of Service) for every time interval short enough). When it does not have, the method of carrying out the parallel operation of two or more image formation sections for the buffer memory of the amount near one frame or it is not practically equal mainly produced commercially for the public from the ground of economical efficiency in essence with carrying out parallel operation of two or more sets of the printers.

[0011] this invention aims at being made in view of the above, and suppressing the cost elevation accompanied by a parallel operation in the equipment which the parallel arrangement of two or more image formation sections is carried out equipment ], and carries out a parallel operation, and enabling high-speed printing processing.

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MEANS

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[The means for solving a technical problem] If it is in the array type printer concerning a claim 1 in order to attain the above-mentioned purpose In the array type printer which accepts the print data supplied and performs printing processing in parallel from the exterior Two or more image formation meanses to form a picture image in the recording paper according to the image data which has been arranged in the shape of an array and supplied, respectively, A picture image drawing means to process it into the image data which should draw the aforementioned print data, and to output this image data, Bandwidth is guaranteed, and it has a multiple address function, and has the bus device which connects the aforementioned picture image drawing means and two or more aforementioned image formation meanses, the image data from the aforementioned picture image drawing means is supplied to two or more aforementioned image formation meanses in multiple address via the aforementioned bus device, and an parallel printing operation is performed.

[0013] Moreover, if it is in the array type printer concerning a claim 2, the aforementioned bus device is IEEE. Standard for a High Performance Serial The bus device specified by Bus (IEEE Std 1394-1995) is used.

[0014] Moreover, if it is in the array type printer concerning a claim 3, the aforementioned image formation means is equipped with a power control means to input the power supplied from mainframe power through a power connector as IEEE1394 interface specified in IEEE1394, and to control start/halt of the electric power supply at the time of \*\*\*\*\* for the aforementioned power connector area.

[0015]

[Gestalt of implementation of invention] Hereafter, the array type printer of this invention is explained with reference to an accompanying drawing. In addition, in each drawing shown below, in order to simplify an explanation, this invention and directly, the sites (for example, an electrical power system, a control system, a user interface, etc.) which are not related are omitted. Moreover, especially, although it is description which mainly directed its attention to the data flow between each part, as long as there is no notice, an ellipsis fraction is based on the function of a usual printer etc.

[0016] [Gestalt 1 of enforcement] drawing 1 is explanatory drawing showing the outline configuration of the array type printer concerning the gestalt 1 of enforcement. In drawing, 100 is the mainframe of an array type printer. The external-interface section 101, The picture image drawing section 102 as a picture image drawing means which generates the image data for drawing and sends the image data which drew through the bus device among the image formation section 103 mentioned later, In order to connect the image formation section 103 as two or more image formation meanses arranged in the shape of an array, and the picture image drawing section 102 and the interface-control section 107 of each image formation section 103 and to transmit image data The bus device 104 in which bandwidth is guaranteed and it has a multiple address (multicasting) function to two or more nodes, The recording paper is held and it has the feed section 105 which delivers the recording paper one by one according to a feed signal, and feeding / conveyance section 106 which conveys the recording paper delivered from the feed section 105 among each image formation section 103.

[0017] Moreover, although the four image formation sections 103 should be carried in this example, the size of the number of the image formation sections 103 is good related still mostly or at least to the essence of this invention. Moreover, although the write-in formula and \*\*\*\* process of the image formation section 103 recognize various presence of laser writing and an electrophotography formula, an ink-jet formula, etc. which are represented by the laser printer, with the gestalt of this enforcement, the image formation section which adopted laser writing and the electrophotography formula is used for it. That is, it has each units (the exposure and electrification - the development, imprint, etc.), fixing / delivery unit, etc. based on the laser-beam study system and the electrophotography process of performing optical writing on a photo conductor drum front face based on image data.

[0018] Next, it explains, supplementing with the function about an operation of the array type printer constituted as mentioned above. The external-interface section 101 has the communication facility with printing demand origin (for example, host computer), and receives the printing demand and print data from printing demand origin. Subsequently, the printing demand and print data which were received are suitably passed the picture image drawing section 102.

[0019] The picture image drawing section 102 draws and creates the image data according to the optical resolution of the image formation section 103 based on print data, and accumulates it in memory etc. if needed. This processing is processing which is generally called a rendering and rasterizing, for example, creates the bit map data of the pixel base from a Page Description Language (PDL).

[0020] The image data created in the picture image drawing section 102 synchronizes with the speed of the electrophotography process of the image formation section 103, and is sent in multiple address (the same image data simultaneous) to each image formation section 103 via the bus device 104 in which the bandwidth in a time interval short enough is guaranteed.

[0021] In each image formation section 103, if required [ without buffering the image data sent synchronizing with an electrophotography process ], via FIFO of small capacity, it is sent to a laser-beam study system, and \*\*\*\*s based on an electrophotography process. In addition, about the detail of this laser-beam study system and an electrophotography process, since it is the technique generally known, an explanation here is omitted.

[0022] feeding / conveyance section 106 which paper is fed to the recording paper from the feed section 105, and this recording paper shows with a dashed line in parallel to execution of a \*\*\*\* process as mentioned above -- going -- this side

of each image formation section 103 -- stopping -- registration -- and a skew correction is carried out. Then, by the imprint charger, the above-mentioned recording paper is conveyed by the imprint section of a \*\*\*\* fraction by predetermined tie \*\*\*\*\* by rebooting of a resist roller, and the toner image formed in the photo conductor drum front face is imprinted, and fixing processing is performed further and paper is delivered.

[0023] now -- the gestalt of enforcement mentioned above -- the four image formation sections 103 -- although it is related when obtaining the printed matter of four sheets simultaneously using all, when dual-output number of sheets is three or less sheets, it controls so that the unnecessary image formation section 103 is beforehand made into a dormant state and feeding to the corresponding image formation section 103 is not performed.

[0024] Moreover, they are able for the throughput of the picture image drawing section 102 and the bandwidth of the bus device 104 to come out enough, and to obtain temporarily, a certain printed matter of the content which is simultaneously different when becoming. However, since this operation is not the main point of this invention, a detailed explanation here is omitted.

[0025] In the array type printer of the gestalt 1 of enforcement mentioned above with the gestalt 2 of this enforcement [the gestalt 2 of enforcement] -- As a bus device in which the bandwidth which connects between the picture image drawing section 102 and each image formation section 103 was guaranteed IEEE Standard for a High Performance Serial The example using the bus device specified by Bus (it is called "IEEE1394" and "IEEE1394 bus" IEEE Std 1394-1995 and the following) is described.

[0026] That is, the fundamental operation is the same as that of the gestalt 1 of enforcement mentioned above, and the synchronous transmission (Isochronous transfer) specified in IEEE1394 is used as a transfer means of the image data which is synchronized with the electrophotography process of the image formation section 103. Moreover, a transfer of transmission and reception of control signals (synchronizing signal between each part etc.), a command, and status information etc. performs altogether the I/O which is needed between the image formation sections 103 via IEEE1394 bus. The formula of using synchronous transmission (Isochronous transfer) in this case, for example, the I/O as which a time precision is required, and using asynchronous transmission (Asynchronous transfer) in being other is effective.

[0027] It adds about synchronous transmission (Isochronous transfer). If IEEE1394 is employed as a printer and Isochronous transfer is used, the merit which can lessen buffer memory carried in a printer will appear effectively in a page printer like a LASER beam printer especially. For example, in the case of a page printer, printing is started after storing the data for 1 page used as a printing object in buffer memory. For this reason, the printer carries several megabytes - some dozens of M bytes of buffer memory. In the case of the page printer of IEEE1394 correspondence, a reduction of a buffer and memory is realized by synchronizing image data with a motion of the laser beam which irradiates a photo conductor drum, and performing Isochronous transfer.

[0028] Drawing 2 is explanatory drawing showing the outline configuration of the array type printer concerning the gestalt 2 of enforcement. The device in which the image formation section 210 mentions this array type printer later so that it may become removable from the mainframe 200 of an array type printer is established to the configuration of drawing 1 mentioned above. Furthermore, while IEEE1394 bus 201 is adopted as a bus device, IEEE1394 interface-control section 202 is formed.

[0029] Using the interface (henceforth "IEEE1394 interface") specified in IEEE1394, IEEE1394 interface-control section 202 has a physical layer, a link layer, a transaction layer, and a bus FM (bus manager ability or Isochronous resource manager ability is included), and controls a transfer of the image data and control signal which passed IEEE1394 bus 201, a command, status information, etc.

[0030] Drawing 3 is explanatory drawing showing the configuration of the image formation section 210 of the array type printer shown in drawing 2. At the time of insertion, in the mainframe 200, this image formation section 210 is constituted so that it may be combined by the power connector 302 connected with the power control section 306 as a power control means which has IEEE1394 interface 301 connected with IEEE1394 interface-control section 304 mentioned later, and the power control function mentioned later, and the connector for feeding 303 which has the function of position doubling with the feed opening.

[0031] Moreover, IEEE1394 interface-control section 304 It has the physical layer specified in IEEE1394, a link layer, a transaction layer, and a bus FM (however, bus manager ability or Isochronous transfer resource manager ability does not need to contain). IEEE1394 bus 201 Pass and the received image data is immediately sent to the write-in control section 305 of a laser-beam study system, and also a control signal, a command, etc. are transmitted to the fraction (not shown) which takes charge of each processing.

[0032] In addition, the photo conductor drum 310 on which the laser-beam study system is used for the image formation section 210 shown in drawing 3 as a formula write-in [ optical ], the electrophotography process is used for it as a \*\*\*\* formula, and a \*\*\*\* latent image is formed based on this process. The electrification charger 311 which carries out uniform electrification of the photo conductor drum 310 at predetermined level, The developer 312 which a toner is made to adhere to the \*\*\*\* latent image formed in the photo conductor drum 310, and is made into the \*\*\*\* picture image of a toner image. It has the cleaning equipment 314 from which the imprint charger 313 which imprints the toner image formed of the developer 312 on the recording paper, the remains toner with which photo conductor drum 310 front face after an imprint remained are removed. Moreover, 315 is a resist roller for performing position doubling of the toner image and the recording paper which were formed in the photo conductor drum 310.

[0033] Moreover, in case the image formation section 210 is \*\*\*\*\*ed from a mainframe 200, even if an operator does not perform a special setup by using the automatic-setting function of the dynamic bus which is the feature of IEEE1394 bus 201, equipment performs the reconstitution of a setup autonomously. Moreover, the power control section 306 bears the electric power supply into the image formation section 210 on the basis of the power supplied from the mainframe 200, and also it takes charge of the control for performing safely the start and a halt of an electric power supply at the time of \*\*\*\*\*.

[0034] In addition, about an operation of the array type printer constituted as mentioned above, since it is fundamentally the same, an explanation here is abbreviated to the gestalt 1 of enforcement.

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DESCRIPTION OF DRAWINGS

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[An easy explanation of a drawing]

[ Drawing 1 ] It is explanatory drawing showing the outline configuration of the array type printer concerning the gestalt 1 of enforcement of this invention.

[ Drawing 2 ] It is explanatory drawing showing the outline configuration of the array type printer concerning the gestalt 2 of enforcement of this invention.

[ Drawing 3 ] It is explanatory drawing showing the configuration of the image formation section of the array type printer shown in drawing 2 .

[An explanation of a sign]

100,200 Mainframe of an array type printer

101 External-Interface Section

102 Picture Image Drawing Section

103,210 Image formation section

104 Bus Device

201 IEEE1394 Bus

202 IEEE1394 Interface Section

301 IEEE1394 Interface

302 Power Connector

303 Connector for Feeding

304 IEEE1394 Interface-Control Section

306 Power Control Section

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[Translation done.]

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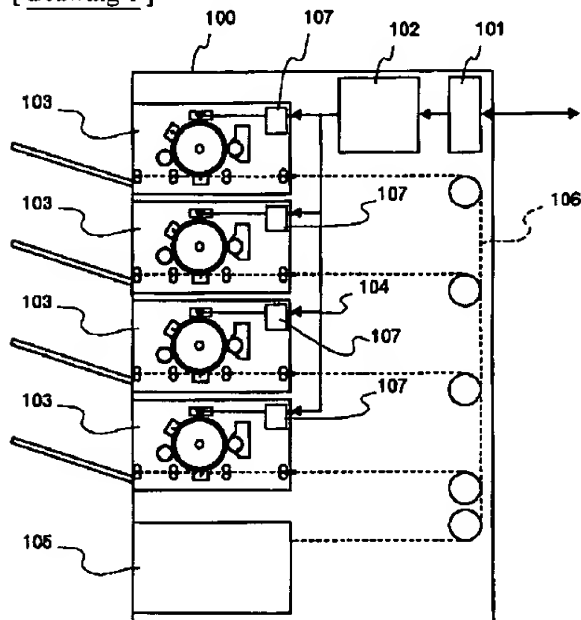
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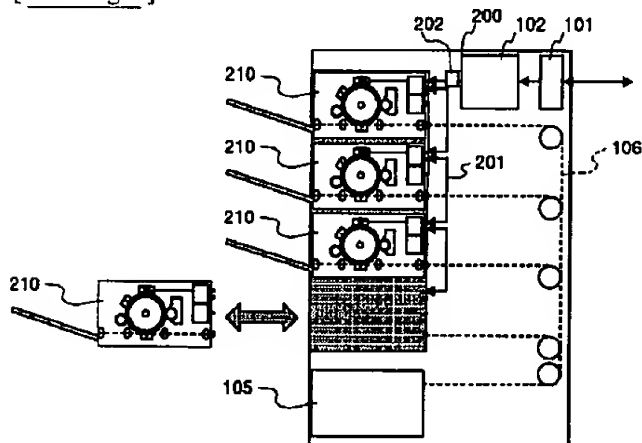
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DRAWINGS

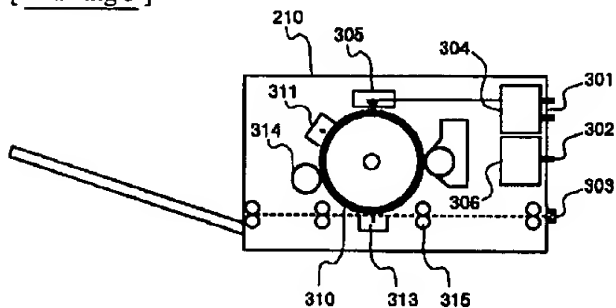
[ Drawing 1 ]



[ Drawing 2 ]



[ Drawing 3 ]



## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : RICOH CO LTD

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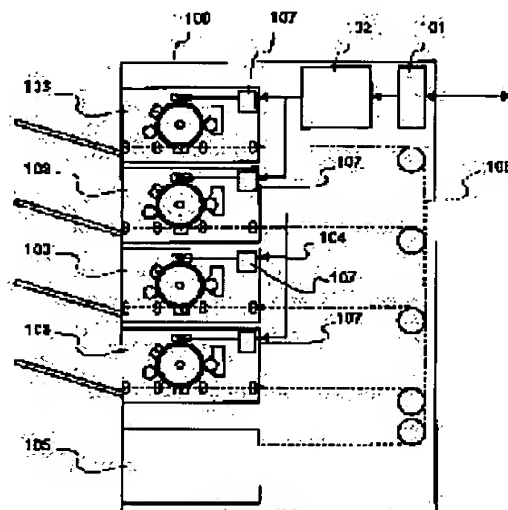
(72)Inventor : KANEYA MITSUHISA

## (54) ARRAY TYPE PRINTER

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To obtain an array type printer comprising a plurality of juxtaposed imaging sections being operated in parallel in which high speed printing can be performed while suppressing cost increase incident to parallel operation.

**SOLUTION:** The array type printer for receiving print data externally and printing the received data in parallel comprises a plurality of imaging sections 103 arranged in array each forming an image corresponding to the received image data onto a recording sheet, an image writing section 102 for processing the print data into an image data to be written, and a bus mechanism 104 for connecting the image writing section 102 with the plurality of imaging sections 103 and having a guaranteed band width and broadcast function wherein print operation is performed in parallel by delivering an image data from the image writing section 102 to the plurality of imaging sections 103 through the bus mechanism 104.





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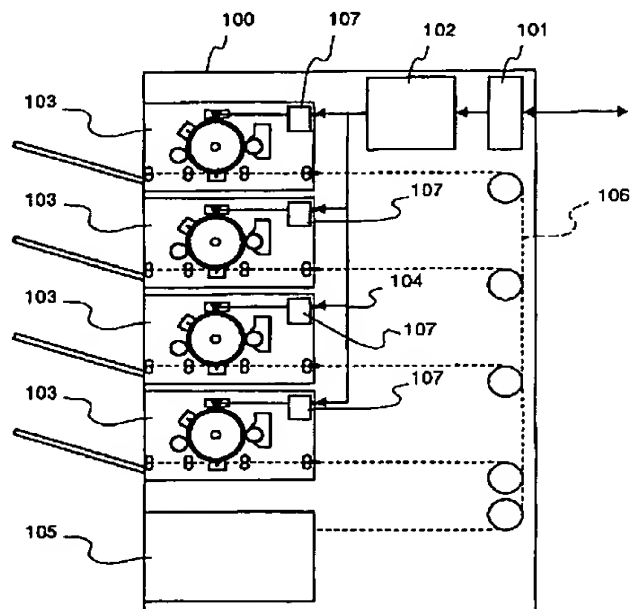
東京都大田区中馬込1丁目3番6号 株式会社リコー内

(54)【発明の名称】 アレイ型プリンタ

(57)【要約】

【課題】 複数の画像形成部を並列配置して並列動作させる装置において、並列動作に伴うコスト上昇を抑制し、かつ高速な印刷処理を可能とすること。

【解決手段】 外部から供給される印刷データを受入れ、並行して印刷処理を行うアレイ型プリンタにおいて、アレイ状に配置され、それぞれ供給された画像データに応じて記録紙に画像を形成する複数の画像形成部103と、印刷データを描画すべき画像データに加工し、該画像データを出力する画像描画部102と、帯域幅が保証され、かつ同報機能を有し、画像描画部102および複数の画像形成部103を繋ぐバス機構104と、を備え、画像描画部102からの画像データをバス機構104を経由して複数の画像形成部103に同報的に供給し、並行印刷動作を行う。



## 【特許請求の範囲】

【請求項1】 外部から供給される印刷データを受入れ、並行して印刷処理を行うアレイ型プリンタにおいて、アレイ状に配置され、それぞれ供給された画像データに応じて記録紙に画像を形成する複数の画像形成手段と、前記印刷データを描画すべき画像データに加工し、該画像データを出力する画像描画手段と、帯域幅が保証され、かつ同報機能を有し、前記画像描画手段および前記複数の画像形成手段を繋ぐバス機構と、を備え、前記画像描画手段からの画像データを前記バス機構を経由して前記複数の画像形成手段に同報的に供給し、並行印刷動作を行うことを特徴とするアレイ型プリンタ。

【請求項2】 前記バス機構は、IEEE Standard for a High Performance Serial Bus (IEEE Std 1394-1995) で規定されているバス機構を用いることを特徴とする請求項1に記載のアレイ型プリンタ。

【請求項3】 前記画像形成手段は、IEEE 1394 で規定されているIEEE 1394 インターフェイスと、本体電源から供給される電力を電源コネクタを介して入力し、かつ前記電源コネクタ部分の括線挿抜時における電力供給の開始/停止の制御を行う電源制御手段と、を備えたことを特徴とする請求項2に記載のアレイ型プリンタ。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】 本発明は、レーザプリンタなどの電子写真プロセス機構を用いた画像形成部をアレイ状に複数配置し、かつ複数の画像形成部それぞれにデータ転送するバスを帯域幅の保証されたバス機構を採用することにより、コストパフォーマンスを実現するアレイ型プリンタに関する。

## 【0002】

【従来の技術】 大量の印刷文書を作成するオフィス環境やコピーセンターなどにおいては、印刷装置が処理する能力、つまり時間当たりの印刷処理枚数が作業効率に大きな影響を及ぼす。このため、文書処理量に応じて、レーザプリンタなど、電子写真プロセスを用いた画像形成部を持った印刷装置などを設置している。

【0003】 ところが、このような類の印刷装置は、高速になるにしたがって多量のフレーム・バッファ用メモリや高速処理が可能なデータ転送専用のバス機構を備える必要があるため、メモリやバス搭載に伴ってコスト上昇を招来させ、経済性を損なうという不具合があった。換言すれば、電子写真プロセスでは、プロセスに対して同期的に画像データを送り込まなければならないため、極めて短い時間間隔で一定量（プロセス速度が速いほど多くなる）のデータを途切れることなく、プロセスに供給する必要がある。

【0004】 そこで、印刷装置の高速化を実現するアプ

ローチとして、画像形成部における作像および給紙などのプロセス速度を速くするといった方法が一般的であるが、装置内に複数の画像形成部を配置し、それらを並行して動作させるといった、いわゆるマルチ型のプリンタが知られている。これは、特に同一内容の印刷物を定められた時間内に、より多く得るための手段として有効である。

【0005】 このようなプリンタに関連する参考技術文献として、例えば、特開平5-324227号の『マルチプリンタシステム及び印刷ジョブの分配方法』が開示されている。ここでは、特に、例えばSCSIバスで構成されるネットワーク分散型双方向データバスを介して、複数の画像形成部を接続し、印刷ジョブを現在稼働していない画像形成部に分配し、印刷処理を行っている。なお、SCSIのデータ転送速度は、一般に最大5Mbpsにとどまる。

## 【0006】

【発明が解決しようとする課題】 しかしながら、上記に示されるような従来の技術にあつては、複数の画像形成部を繋ぐバス、およびフレーム・バッファ用メモリの面において以下に述べるような問題点があった。

## 【0007】 (1) バス

印刷速度が速くなるにしたがって画像データを転送するために高速なバスが必要となる。特に、フルカラー印刷装置におけるデータ量は、例えば解像度が400dpi、記録紙のサイズがA4の場合、約64Mbyteに達する。このような大量のデータを取り扱うためには、一般にバスのビット幅の広いバスが用いられるが、バスの幅が広がるほどバス長を確保することが難しく、かつ接続される負荷に対して敏感なため設計が容易ではない。また、このような、バスは一般にコスト上昇を招来させることになる。

【0008】 さらに、バス上の各ノードに対して時分割で別々にデータ転送を行わなければならないため、画像形成部の数が増加するにしたがって、比例的にデータ転送用バスの帯域幅が要求される。このようなバスの場合、例えば前述のフルカラー印刷装置における画像を各々の画像形成部に送る際には、画像形成部が2つであれば約128Mbyte、4つであれば約256Mbyteものデータ転送が発生することになる。このような、多量のデータを実用的な時間で送ることの可能な帯域幅を持ったバスは、非常に高価であり、経済性の面で問題があった。

【0009】 (2) フレーム・バッファ用メモリ  
バスの実時間性を補うために、各々の画像形成部にはフレーム・バッファ用メモリが必要である。しかし、印刷速度が速くなるにしたがって多くのバッファ・メモリが要求される。また、この場合、バッファ・メモリはデータ転送の遅延の最悪値を想定して装備しなければならない。

【0010】このため、高速な電子写真プロセスでは、データ転送用バスが実時間性（十分に短い時間間隔毎の帯域幅（bandwidth：信号が利用できる最高周波数と最低周波数との差，Quality of Serviceともいう）を持たない場合，1フレーム分あるいはそれに近い量のバッファ・メモリを複数の画像形成部を並列動作させる方法は複数台の印刷装置を並行稼働させることと本質的に大差なく，主に経済性の理由から大衆向けに製品化されていない。

【0011】本発明は，上記に鑑みてなされたものであって，複数の画像形成部を並列配置して並列動作させる装置において，並列動作に伴うコスト上昇を抑制し，かつ高速な印刷処理を可能とすることを目的とする。

#### 【0012】

【課題を解決するための手段】上記の目的を達成するために，請求項1に係るアレイ型プリンタにあっては，外部から供給される印刷データを受入れ，並行して印刷処理を行うアレイ型プリンタにおいて，アレイ状に配置され，それぞれ供給された画像データに応じて記録紙に画像を形成する複数の画像形成手段と，前記印刷データを描画すべき画像データに加工し，該画像データを出力する画像描画手段と，帯域幅が保証され，かつ同報機能を有し，前記画像描画手段および前記複数の画像形成手段を繋ぐバス機構と，を備え，前記画像描画手段からの画像データを前記バス機構を経由して前記複数の画像形成手段に同報的に供給し，並行印刷動作を行うものである。

【0013】また，請求項2に係るアレイ型プリンタにあっては，前記バス機構は，IEEE Standard for a High Performance Serial Bus（IEEE Std 1394-1995）で規定されているバス機構を用いるものである。

【0014】また，請求項3に係るアレイ型プリンタにあっては，前記画像形成手段は，IEEE 1394で規定されているIEEE 1394インターフェイスと，本体電源から供給される電力を電源コネクタを介して入力し，かつ前記電源コネクタ部分の括線挿抜時における電力供給の開始／停止の制御を行う電源制御手段と，を備えたものである。

#### 【0015】

【発明の実施の形態】以下，本発明のアレイ型プリンタについて添付図面を参照して説明する。なお，以下に示す各図では説明を簡略化するため，本発明と直接には関係しない部位（例えば，電源系，制御系，ユーザ・インターフェイスなど）を省略している。また，主に各部間のデータの流れに着目した記述となっているが，特に断りのない限り省略部分は通常の印刷装置の機能などに準拠するものである。

【0016】【実施の形態1】図1は，実施の形態1に

係るアレイ型プリンタの概略構成を示す説明図である。図において，100はアレイ型プリンタの本体であり，外部インターフェイス部101と，描画対象の画像データを生成し，後述する画像形成部103にバス機構を介して描画した画像データを送る画像描画手段としての画像描画部102と，アレイ状に配置した複数の画像形成手段としての画像形成部103と，画像描画部102と各画像形成部103のインターフェイス制御部107とを繋ぎ，画像データを転送するために，帯域幅が保証され，かつ複数のノードに対する同報（マルチキャスト）機能を有するバス機構104と，記録紙を収容し，給紙信号に従って記録紙を順次送り出す給紙部105と，給紙部105から送り出された記録紙を各画像形成部103に搬送する給紙・搬送部106と，を備えている。

【0017】また，この例では4つの画像形成部103を搭載したものとしているが，画像形成部103の数の大小は本発明の本質には関係なく，さらに多く，あるいは少なくともよい。また，画像形成部103の書込方式・作像プロセスは，レーザープリンタに代表されるレーザ書込み・電子写真方式やインクジェット方式など様々な存在するが，この実施の形態ではレーザ書込み・電子写真方式を採用した画像形成部を用いる。すなわち，画像データに基づいて感光体ドラム表面に光書き込みを行うレーザ光学系，電子写真プロセスに基づいた各ユニット（露光・帯電・現像・転写など）および定着・排紙ユニットなどを備えている。

【0018】次に，以上のように構成されたアレイ型プリンタの動作についてその機能を補足しながら説明する。外部インターフェイス部101は，印刷要求元（例えば，ホストコンピュータ）との通信機能を有し，印刷要求元からの印刷要求および印刷データを受け取る。次いで，その受け取った印刷要求および印刷データは適宜画像描画部102へ渡される。

【0019】画像描画部102は，印刷データに基づいて画像形成部103の光学的な解像度に応じた画像データを描画・作成し，必要に応じてメモリなどに蓄積する。この処理は，一般にレンダリングおよびラスライズと呼称され，例えば，ページ記述言語（PDL）から画素ベースのビットマップデータを作成するような処理である。

【0020】画像描画部102で作成された画像データは，画像形成部103の電子写真プロセスの速度と同期し，十分に短い時間間隔における帯域幅が保証されているバス機構104を経由し，各々の画像形成部103に対して同報的に（同一の画像データを同時に）送られる。

【0021】各々の画像形成部103では，電子写真プロセスと同期して送られてくる画像データがバッファリングされることなく，あるいは必要ならば小容量のFIFOを経由し，レーザ光学系へと送られ，電子写真プロ

セスに基づいて作像される。なお、このレーザ光学系および電子写真プロセスの詳細については、一般的に知られている技術であるので、ここでの説明は省略する。

【0022】上述した如く、作像プロセスの実行と並行して、給紙部105から記録紙が給紙され、該記録紙が破線で示す給紙・搬送部106を経由し、各々の画像形成部103の手前で一旦停止し、レジストレーションおよびスキュー補正される。その後、レジストローラの再起動により上記記録紙が所定のタイミングで作像部分の転写部に搬送され、転写チャージャによって、感光体ドラム表面に形成されたトナー像が転写され、さらに定着処理が行われ、排紙される。

【0023】さて、上述した実施の形態では、4つの画像形成部103すべてを用い、同時に4枚の印刷物を得る場合に関するものであるが、同時出力枚数が3枚以下の場合には、あらかじめ不用な画像形成部103を休止状態とし、かつその該当する画像形成部103への給紙が行われないように制御する。

【0024】また、仮に、画像描画部102の処理能力およびバス機構104の帯域幅が十分であるならば、同時に異なった内容の印刷物を得ることも可能である。しかし、この動作は本発明の主旨ではないので、ここでの詳述は省略する。

【0025】〔実施の形態2〕この実施の形態2では、前述した実施の形態1のアレイ型プリンタにおいて、画像描画部102および各々の画像形成部103間を繋ぐ帯域幅の保証されたバス機構として、IEEE Standard for a High Performance Serial Bus (IEEE Std 1394-1995, 以下、「IEEE1394」および「IEEE1394バス」という)で規定されているバス機構を用いる例について述べる。

【0026】すなわち、基本的な動作は、前述した実施の形態1と同様であり、画像形成部103の電子写真プロセスと同期した画像データの転送手段として、IEEE1394で規定されている同期転送 (Isochronous 転送) を用いる。また、制御信号 (各部間の同期信号など) の送受信、コマンドおよびステータス情報の転送など、画像形成部103との間で必要となる入出力は、すべてIEEE1394バスを経由して行う。この際、例えば、時間的精度が要求される入出力には同期転送 (Isochronous 転送) を、それ以外の場合には非同期転送 (Asynchronous 転送) を用いるといった方式が有効である。

【0027】同期転送 (Isochronous 転送) について付言する。IEEE1394をプリンタに採用し、Isochronous 転送を使うと、プリンタに搭載するバッファ・メモリを少なくできるメリットが、特に、レーザプリンタのようなページ・プリンタにおいて有効的に現れる。例えば、ページ・プリンタの場合に

は、印刷対象となる1ページ分のデータをバッファ・メモリに格納してから印刷が開始される。このため、プリンタは数Mbyte〜数十Mbyteのバッファ・メモリを搭載している。IEEE1394対応のページ・プリンタの場合、画像データを感光体ドラムに照射するレーザ光の動きに同期させてIsochronous 転送を行うことにより、バッファ、メモリの低減が実現する。

【0028】図2は、実施の形態2に係るアレイ型プリンタの概略構成を示す説明図である。前述した図1の構成に対し、このアレイ型プリンタは、画像形成部210がアレイ型プリンタの本体200から着脱可能となるように後述する機構が設けられている。さらに、バス機構としてIEEE1394バス201を採用すると共に、IEEE1394インターフェイス制御部202を設ける。

【0029】IEEE1394インターフェイス制御部202は、IEEE1394で規定されているインターフェイス (以下、「IEEE1394インターフェイス」という) を用い、物理層、リンク層、トランザクション層、バス管理機能 (バス・マネージャ機能あるいはIsochronous リソース・マネージャ機能を含む) を有し、IEEE1394バス201を通じた画像データや制御信号、コマンド、ステータス情報などの転送を制御する。

【0030】図3は、図2に示したアレイ型プリンタの画像形成部210の構成を示す説明図である。この画像形成部210は、装着時には本体200とは、後述するIEEE1394インターフェイス制御部304と接続されるIEEE1394インターフェイス301、後述する電源制御機能を有する電源制御手段としての電源制御部306と接続される電源コネクタ302、給紙口との位置合わせの機能を有する給紙用コネクタ303によって結合されるように構成されている。

【0031】また、IEEE1394インターフェイス制御部304は、IEEE1394で規定されている物理層、リンク層、トランザクション層、バス管理機能 (ただし、バス・マネージャ機能あるいはIsochronous 転送リソース・マネージャ機能は含んでいなくてもよい) を有し、IEEE1394バス201を通じて受け取った画像データを即座に、レーザ光学系の書き込み制御部305へ送るほか、制御信号、コマンドなどは各々の処理を受け持つ部分 (図示せず) へと転送する。

【0032】なお、図3に示す画像形成部210は、光書き込み方式としてレーザ光学系を、作像方式として電子写真プロセスを用いており、該プロセスに基づいて、静電潜像が形成される感光体ドラム310と、感光体ドラム310を所定のレベルに均一帯電する帯電チャージャ311と、感光体ドラム310に形成された静電潜像

にトナーを付着させ、トナー像の顕像画像とする現像装置312と、現像装置312によって形成されたトナー像を記録紙に転写する転写チャージャ313と、転写後の感光体ドラム310表面に残った残留トナーなどを除去するクリーニング装置314などを備えている。また、315は感光体ドラム310に形成されたトナー像と記録紙との位置合わせを行うためのレジストローラである。

【0033】また、本体200から画像形成部210を括線挿抜する際には、IEEE1394バス201の特長である動的なバスの自動設定機能を用いることにより、作業者が特別な設定を行わなくても装置が自律的に設定の再構成を行う。また、電源制御部306は、本体200より供給された電力を基に画像形成部210内への電力供給を担うほか、括線挿抜時における電力供給の開始や停止を安全に行うための制御を受け持っている。

【0034】なお、以上のように構成されたアレイ型プリンタの動作については、実施の形態1と基本的に同様であるので、ここでの説明は省略する。

【0035】〔実施の形態の効果〕次に、以上述べてきた実施の形態1、2のアレイ型プリンタが奏する効果について、性能、コスト、保守性、柔軟性・拡張性の各項目別にまとめて記述する。

#### 【0036】(1) 性能

n台（この場合、4台）の画像形成部103あるいは画像形成部210を並列配置し、並列動作させることにより、同一性能の画像形成部を1台のみ使用した印刷装置と比べて、n倍の印刷速度と等価の性能を得ることができる。これは特に、単一のソースから複数の印刷物を得るような使い方において、大きな効果を発揮する。

【0037】また、ネットワークなどにより接続されたn台の印刷装置からの同一内容の印刷物を出力させる場合は、印刷要求元から各々の印刷装置に対して別々に印刷データを送る必要がある（複数（n）回のデータ転送を行う）ので、このような従来の印刷装置に対し、この実施の形態のアレイ型プリンタは、一回のデータ転送を行うだけで済むことから、特にデータ転送がボトルネックとなるような比較的低速なネットワーク環境において性能的な優位が顕著となる。

#### 【0038】(2) コスト

画像形成部103・画像形成部210毎にフレーム・バッファ用メモリを持つ必要がないこと、および全ての画像形成部103が同じ画像描画部102から画像データが供給されるため、印刷装置につき一つの画像描画部102を持つだけで十分であるため、メモリ数の低減などにより経済的な装置が実現する。

【0039】また、実施の形態2のアレイ型プリンタでは、画像データに限らず、制御信号、コマンド、ステータス情報など画像形成部210に対する全ての入出力のために、高性能で、かつ安価なIEEE1394バス2

01を使用しているため、データ転送専用の高価なバス機構などが不要であるから、さらにコスト・パフォーマンスの高い装置を提供することが可能となる。

#### 【0040】(3) 保守性

実施の形態2で説明したように、アレイ型プリンタの本体200から画像形成部210を着脱自在な構成としたことにより、現像用のトナーの補充、および記録紙の搬送ジャム（紙詰まり）や機内清掃などといったサブライ補給作業、メンテナンス作業を容易に行うことが可能となる。また、ある画像形成部210が故障した場合には、該当する画像形成部210を別な画像形成部と入れ替えることも可能である。

【0041】さらに、IEEE1394バス201の特長である括線挿抜と動的なバスの自動設定機能を用いることにより、印刷装置全体の電源を遮断することなく、稼働状態で保守作業などを行うことができ、かつ作業者が特別な設定を行わなくても自律的に設定の再構成が行えるような装置の実現が可能となる。

#### 【0042】(4) 柔軟性・拡張性

搭載する画像形成部103・画像形成部210の数を増減することにより、同一の基本設計で様々な能力の印刷装置を実現することが可能である。また、実施の形態2のアレイ型プリンタでは、装置メーカが追加用の画像形成部210をオプションユニットとして用意しておくことにより、ユーザは必要に応じて装置の拡張を行うことができ、柔軟にシステムを構築することが可能となる。

【0043】例えば、装置導入の初期段階は少数（1つあるいは2つ）の画像形成部210のみを搭載しておき、印刷速度など性能的な必要性に応じて後から画像形成部210を追加するといったことが可能となる。

【0044】また、IEEE1394バスが有する動的なバスの設定機能を用いることにより、サービスマンなどの熟練者に作業を依頼したり、装置設定の変更作業を行ったりすることなく、エンド・ユーザが簡単に画像形成部210の追加作業を行うことができる。

#### 【0045】

【発明の効果】以上説明したように、本発明に係るアレイ型プリンタ（請求項1）によれば、複数の画像形成手段を並列配置し、並列動作させるため、同一性能の画像形成手段を1台のみ使用した印刷装置と比べて、使用する画像形成手段の数に比例した印刷処理を行うことができ、かつ画像形成手段毎にフレーム・バッファ用メモリを持つ必要がなく、さらに全ての画像形成手段が同じ画像描画手段からの画像データが供給されるため、印刷装置につき一つの画像描画手段を持つだけで十分であるため、メモリ数の低減などにより経済的な装置が実現する。

【0046】また、本発明に係るアレイ型プリンタ（請求項2）によれば、請求項1の効果に加え、さらに、画像データに限らず、制御信号、コマンド、ステータス情

報など画像形成手段に対する全ての入出力のために、高性能で、かつ安価なIEEE1394バスを使用しているため、データ転送専用の高価なバス機構などが不要であるから、さらにコスト・パフォーマンスの高い装置を提供することが可能となる。

【0047】また、本発明に係るアレイ型プリンタ（請求項3）によれば、IEEE1394バスの特長である括線挿抜と動的なバスの自動設定機能を用いることにより、印刷装置全体の電源を遮断することなく、稼働状態で保守作業などを行うことができ、かつ作業者が特別な設定を行わなくても自律的に設定の再構成が行えるような装置の実現が可能となると共に、画像形成手段の保守性および拡張性などが向上する。

#### 【図面の簡単な説明】

【図1】本発明の実施の形態1に係るアレイ型プリンタの概略構成を示す説明図である。

【図2】本発明の実施の形態2に係るアレイ型プリンタ

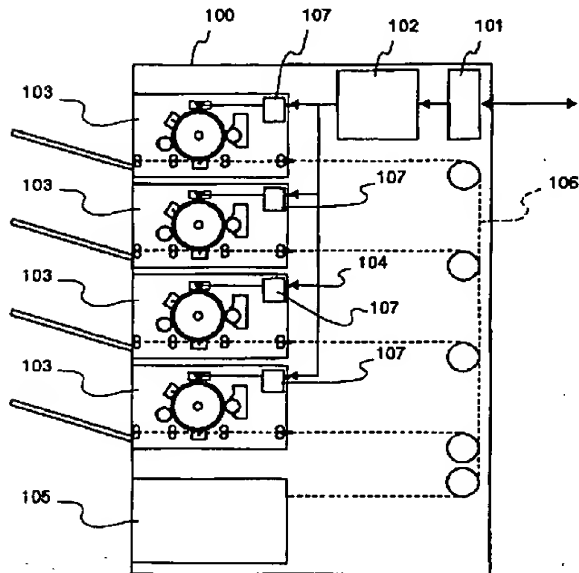
の概略構成を示す説明図である。

【図3】図2に示したアレイ型プリンタの画像形成部の構成を示す説明図である。

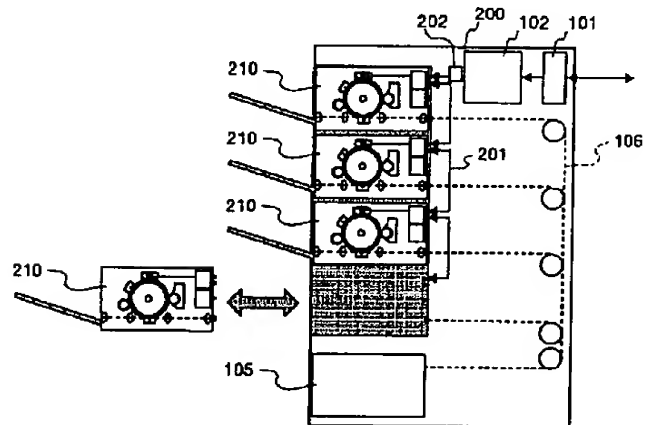
#### 【符号の説明】

- 100, 200 アレイ型プリンタの本体
- 101 外部インターフェイス部
- 102 画像描画部
- 103, 210 画像形成部
- 104 バス機構
- 201 IEEE1394バス
- 202 IEEE1394インターフェイス部
- 301 IEEE1394インターフェイス
- 302 電源コネクタ
- 303 給紙用コネクタ
- 304 IEEE1394インターフェイス制御部
- 306 電源制御部

【図1】



【図2】



【図3】

